2009

# Research Update Meeting 2009 - Research Programs at the Cranberry Station

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# Cranberry Station Update

Carolyn DeMoranville, Director

UMass Amherst Cranberry Station

# Grower support

- Grower grant sources
  - Cape Cod Cranberry Growers Association
  - Cranberry Research Foundation
  - Cranberry Institute
  - Ocean Spray
  - Wisconsin Cranberry Board
- 2008 - $71,340
- In-kind contributions and gifts in 2008
  - $17,350

# Grant support – mostly competitive government funding

- Hatch Funds from UMass Ag Experiment Station
- IR-4 – support for minor use pesticide registrations
- USDA:  NE-IPM, SARE
- Industry (chemical companies)
- MDAR – Ag innovations

- Current value of all active grants - ~$2.2 million
- New awards in 2008 - ~$800,000

- Grant review for past 4 years in the handout

# University support

- Amherst
  - Faculty salaries
  - Support staff (office, bog)
  - Operations (utilities, etc.)
- Dartmouth
  - Technical support for Peter's program
- Central administration/Amherst
  - Operating funds

# Thanks for the support

- CCCGA, Cranberry Research Foundation
- Ocean Spray
- Cranberry Institute
- Industry contributors
  - grants
  - meeting support – see the poster near the coffee
- Individual grower cooperators and donors

# Phosphorus Management and Reduction Implementation

Carolyn DeMoranville

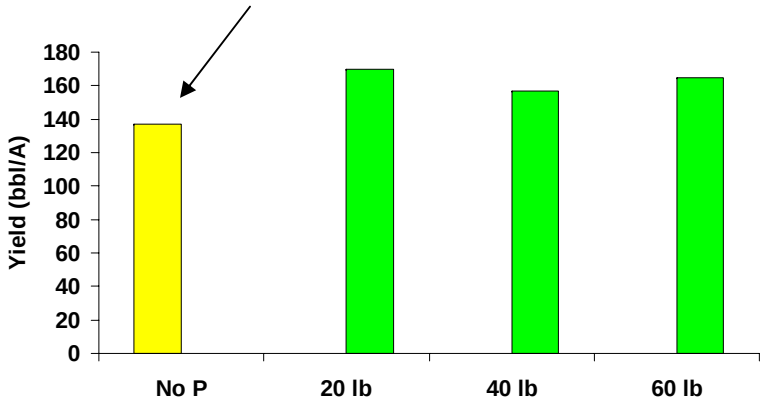
UMass Amherst Cranberry Station

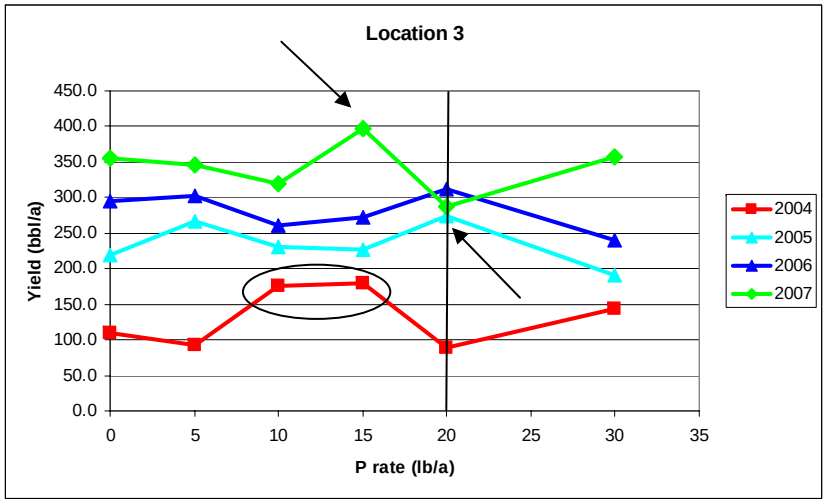
# Why P reduction?

- Pollution concerns for fresh water
- Clean Water Act mandated TMDL process
- P is expensive – we need to use only enough to assure that the plants have what they need

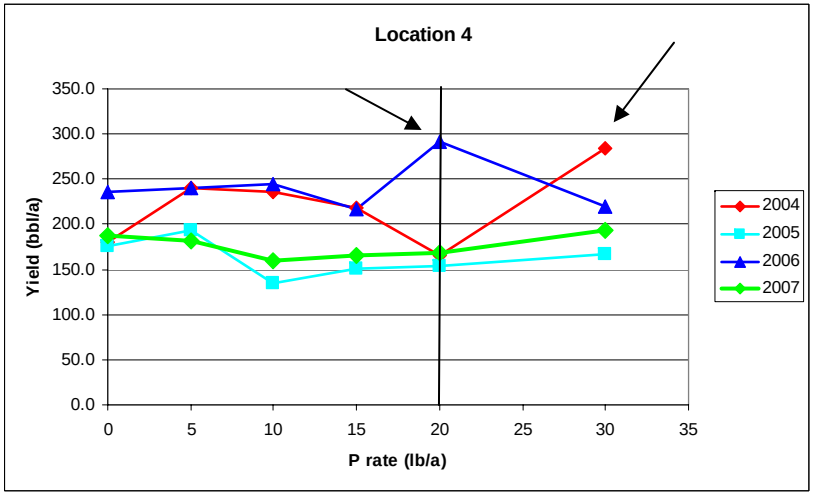
# Background

- Actual P requirement based on plant composition/ growth is low
  - “trash” plus 200 bbl crop removes 4.2 lb P/acre
- Soil testing is problematic for planning due to lack of calibration ability – acid soils
- Tissue testing should be a better tool (established standard value of 0.1 to 0.2%)
- For best planning, a target P application range should also be established



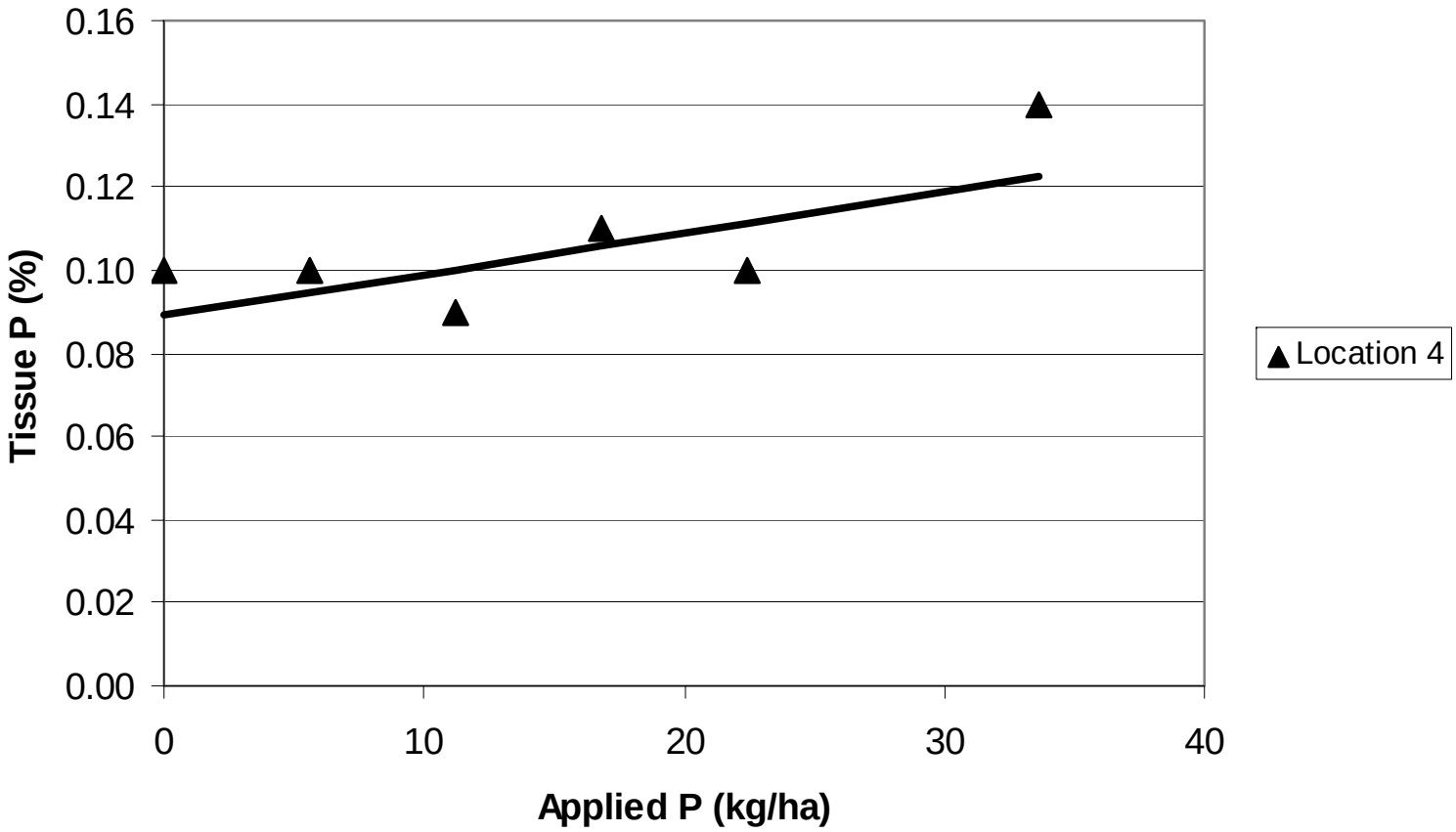

Tissue P in normal range




Tissue P below normal range

# Tissue P

(2006 regression data)




# Summary – recent field plots

- Trends indicate that some P may be better than no P, although not much of a rate response
- At one location P in the tissue was below the standard range and there was a response to >20 lb P/acre
- Further justification for a target P rate of no more than 20 lb P/acre and some justification for lower rate consideration

# Fertilizer and yield – whole bog comparison

(P in lb·a$^{-1}$; Yield in bbl·a$^{-1}$)

| | Site 1 | | Site 2 | |
|---|---|---|---|---|
| **Year** | **P rate** | **Yield** | **P rate** | **Yield** |
| 2002 | 17.8 | 117 | 24.9 | 117 |
| 2003 | 14.4 | 119 | 22.3 | 119 |
| 2004 | 5.6 | 172 | 17.3 | 196 |
| 2005 | 16.5 | 190 | 24.0 | 121 |
| 2006 | 6.4 | 163 | 5.7 | 244 |
| 2007 | 10.4 | 156 | 11.4 | 136 |
| pre-reduction | 17.8 | 117 | 22.1 | 138 |
| post-reduction | 10.7 | 160 | 8.6 | 190 |

# Fertilizer and yield – whole bog comparison

(P in lb·a$^{-1}$; Yield in bbl·a$^{-1}$)

| | Site 3 | | Site 4 | |
|---|---|---|---|---|
| **Year** | **P rate** | **Yield** | **P rate** | **Yield** |
| 2002 | 28.8 | 221 | 35.5 | [65]* |
| 2003 | 19.8 | 136 | 32.4 | 150 |
| 2004 | 21.2 | 218 | 28.0 | 277 |
| 2005 | 26.1 | 134 | 24.8 | 159 |
| 2006 | 7.1 | 256 | 12.9 | 286 |
| 2007 | 14.7 | 197 | 16.7 | 252 |
| pre-reduction | 28.8 | 221 | 30.2 | 195 |
| post-reduction | 17.8 | 188 | 14.8 | 269 |

*Insect infestation at this site in 2002

## Site 3 has biennial trends so we looked at 2-year periods

| Site | Avg. Yield (bbl·a$^{-1}$) 2001-2002 | 2003-2004 | 2005-2006 | Avg. Fertilizer P (lb·a$^{-1}$) 2002 | 2003-2004 | 2005-2006 |
|---|---|---|---|---|---|---|
| 3 | 187 | 177 | 196 | 28.8 | 20.5 | 16.6 |

# Cranberry Bog Total Phosphorus – water quality

| | TP Fertilization ($lb \cdot a^{-1}/yr$) | TP incoming ($lb \cdot a^{-1}/yr$) | TP leaving ($lb \cdot a^{-1}/yr$) | TP export (net) ($lb \cdot a^{-1}/yr$) |
|---|---|---|---|---|
| **Bog ID** | **Mean 2003-04** | | | |
| 1 | 10.0 | 0.5 | 2.0 | 1.5 |
| 2 | 19.8 | 1.9 | 4.6 | 2.7 |
| 3 | 20.5 | 2.1 | 1.5 | -0.6 |
| 4 | 38.0 | 1.9 | 1.7 | -0.2 |

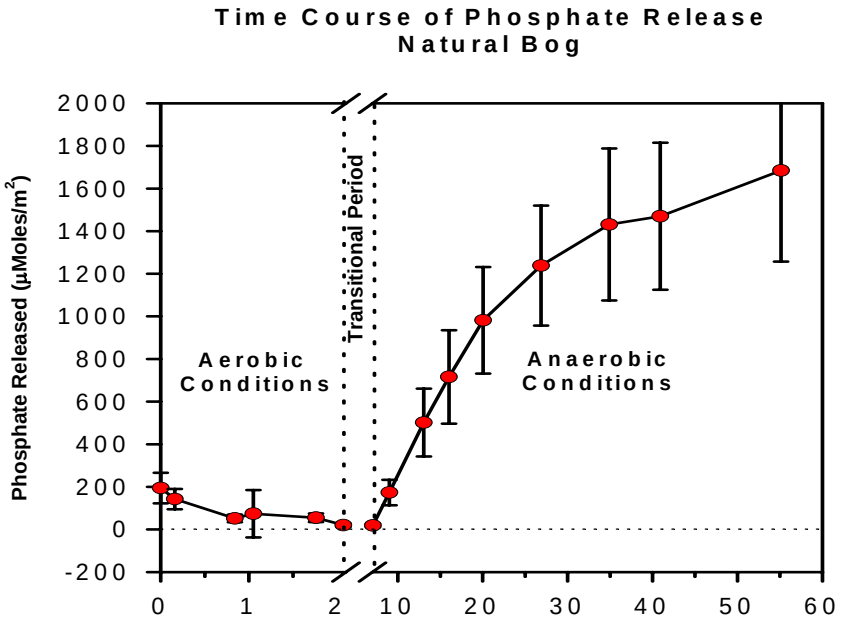
# Impact of P reduction on quality of flood discharge water

**mean mg·L$^{-1}$ TP in flood discharges**

| Site | 2002 | 2003 | 2004 | 2005 | 2007* |
|---|---|---|---|---|---|
| 1 | 0.377 | 0.424 | 0.237 | 0.097 | 0.157 |
| 2 | 0.384 | 0.439 | 0.528 | 0.408 | |
| 3 | 0.100 | 0.170 | 0.118 | | |
| 4 | 0.109 | 0.127 | 0.147 | | |

reduction

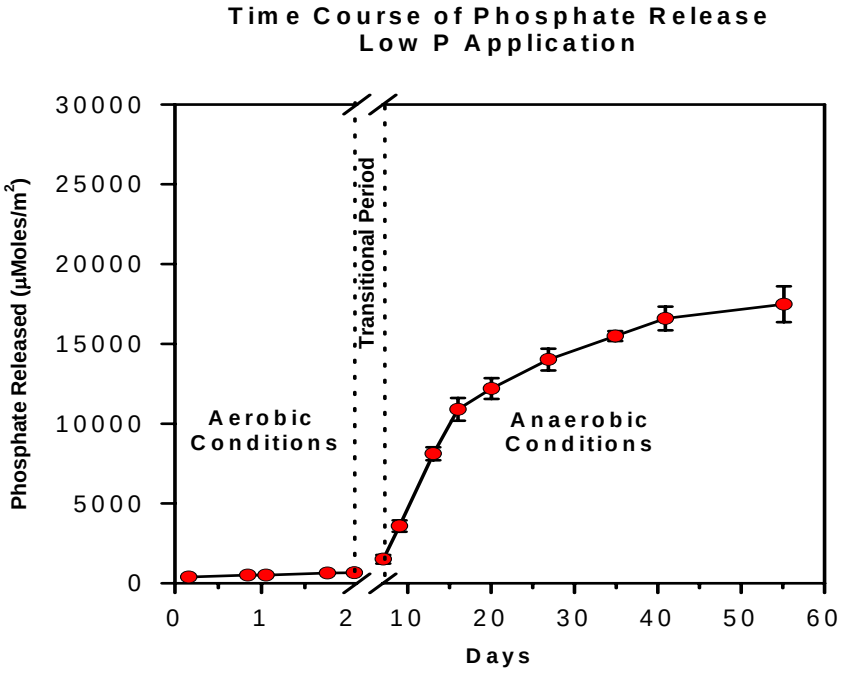
*Limited sample set

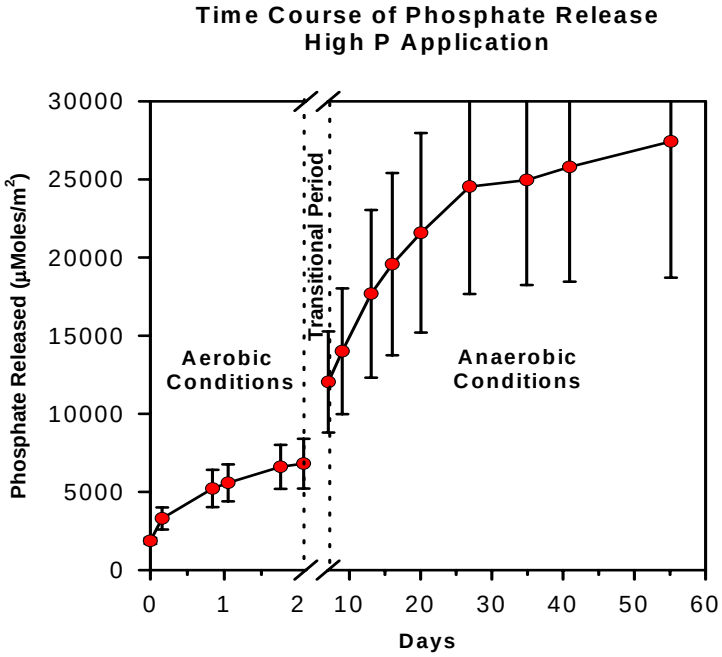


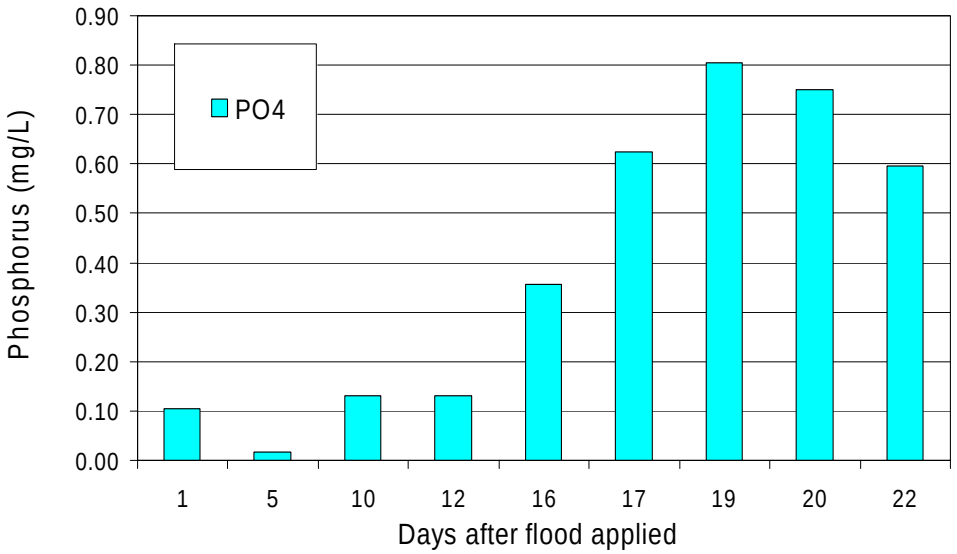

Native bog

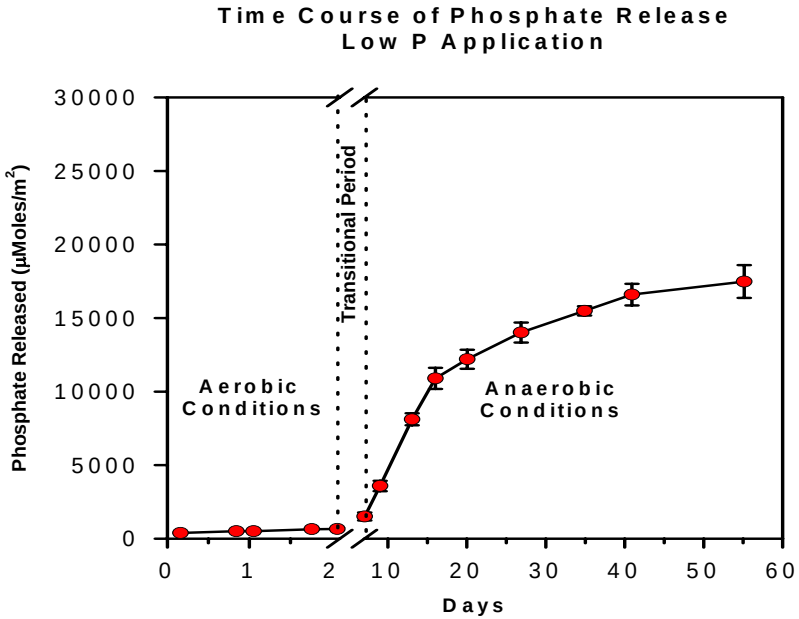
10-18 lb▪a$^{-1}$ P

>20lb▪a$^{-1}$ P

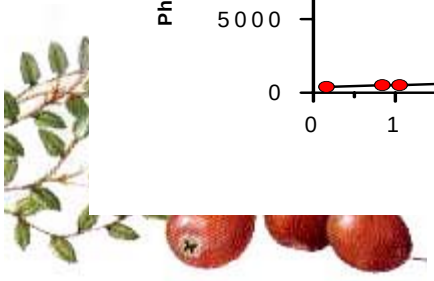





- Laboratory results were similar to those in water collected from a harvest flood



# BMP recommendations

- Apply no more than 20 lb·a$^{-1}$ P per season
  - Based on the laboratory study, highest risk for P mobilization - bogs receiving >20 lb·a$^{-1}$ P
- Allow particles to settle prior to discharge of harvest flood but do not hold the flood for more than ~10 days

# Recommendation to use no more than 20 lb/a P
# Monitor outcomes when using less

- Generally, in the year of application, the crop can recover 10-30% of that applied
- A 200 bbl crop (with harvest trash) removes 4.2 lb/acre
- Use tissue testing along with yield monitoring

# Tissue standard is 0.1-0.2% P

<0.1% --- increase P rate and retest next year

0.1 – 0.11% -- stay the course but retest next year

0.12 – 0.15% -- test again in 2-3 years

0.16% or greater – test again in 3-4 years

# Fertilizer choices and P reduction

- High P ratio
  - 5-15-30
  - 3-13-26
  - 12-24-12
  - 6-24-24
  - 8-32-16
- Low P ratio
  - 15-15-15, 13-13-13
  - 15-15-20
  - 10-12-24
  - 18-8-18
  - 15-10-18
  - 16-15-21
  - 5-5-20 (alternative with low N)

Advantage of 18-8-18:

Fewer pounds to apply (based on N requirement)

Lower application cost

# Calculations

- The number on the bag is <u>not</u> actual P!!

$$P \xrightarrow{\text{X } 2.29} P_2O_5$$

$$P_2O_5 \xrightarrow{\text{X } 0.44} P$$

What's on the bag!

# Calculations

- Example #1 – 45 lb N

I used 375 lb/acre 12-24-12 – how much P?

375 x 0.24 x 0.44 = 39.6 lb/acre

0.24 is the bag number converted to a decimal

0.44 converts $P_2O_5$ to actual P

# Calculations

- Example #2 – 45 lb N

I used 250 lb/acre 18-8-18 – how much P?

250 x 0.08 x 0.44 = 8.8 lb/acre

0.08 is the bag number converted to a decimal

0.44 converts $P_2O_5$ to actual P

# Calculations

- Example #3 – 45 lb N

I used 300 lb/acre 15-15-15 – how much P?

300 x 0.15 x 0.44 = 19.8 lb/acre

0.15 is the bag number converted to a decimal

0.44 converts $P_2O_5$ to actual P

# Summary

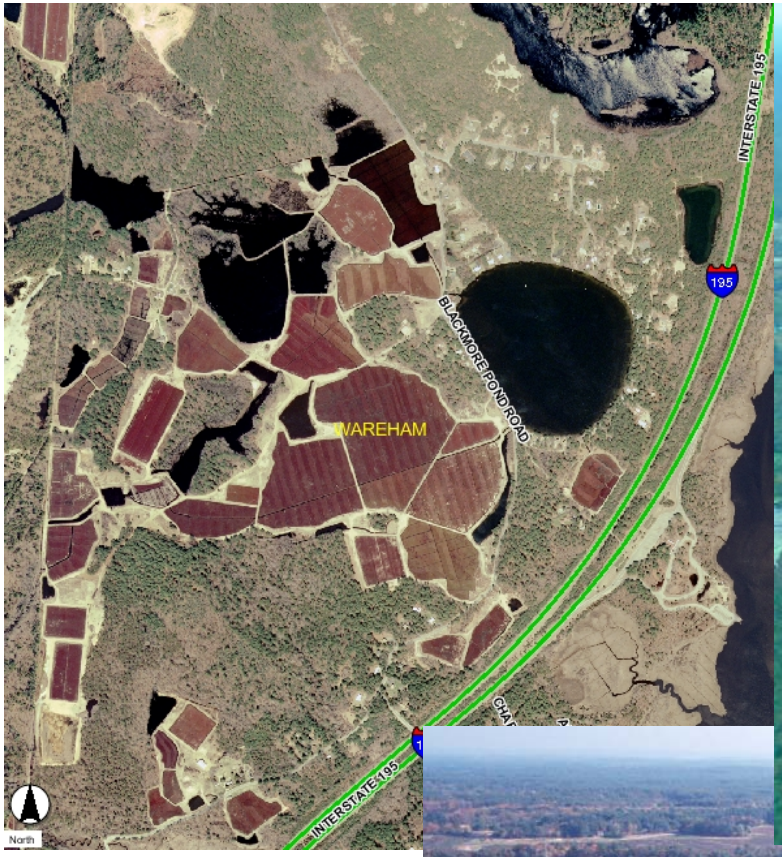
| Material used | Pounds applied | Pounds N per acre | Pound P per acre |
|---|---|---|---|
| 12-24-12 | 375 | 45 | 40 |
| 18-8-18 | 250 | 45 | 9 |
| 15-15-15 | 300 | 45 | 20 |

## Set fertilizers: Max N applied to maintain P<20 lb/acre

| Material used | Pounds P per acre | Pounds fertilizer | Pounds N per acre |
|---|---|---|---|
| 12-24-12 | 20 | 188 | 22.5 |
| 18-8-18 | 20 | 568 | 102 |
| 10-12-24 | 20 | 379 | 38 |
| 15-10-18 | 20 | 454 | 68 |
| 15-15-15 | 20 | 300 | 45 |
| 19-19-19 | 20 | 235 | 45 |

# Low N materials – how much P in 100 lbs.

| Material used | Pounds fertilizer | Pounds N per acre | Pounds P per acre |
|---|---|---|---|
| 3-13-26 | 100 | 3 | 5.7 |
| 5-15-30 | 100 | 5 | 6.6 |
| 5-10-10 | 100 | 5 | 4.4 |
| 6-24-24 | 100 | 6 | 10.6 |
| 8-32-16 | 100 | 8 | 14.1 |
| 5-5-20 | 100 | 5 | 2.2 |


WAREHAM
BLACKMORE POND ROAD
INTERSTATE 195
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Questions?


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# Sanding and Pruning

SARE Project

C. DeMoranville, H. Sandler, J. Vanden Heuvel,

A. Averill, M. Sylvia, F. Caruso, B. Suhayda

UMass Amherst Cranberry Station

# Side - by – Side Comparisons

- Sanding, followed by pruning at some set interval
  - 2 yr, 3 yr, or 4 yr+

# Treated in 2006 – Evaluated in 2006 and 2007

| Location | Years since sand | Pruned? | Yield | Yield - following year | Cumulative yield | density year of pruning | density year after |
|---|---|---|---|---|---|---|---|
| Site #2 | 2 | Yes | 230 | 361 | 591 | 108 | 132 |
| | 2 | No | 333 | 188 | 521 | 106 | 112 |
| Site #3 | 2 | Yes | 319 | 324 | 643 | 97 | 107 |
| | 2 | No | 420 | 303 | 723 | 103 | 100 |
| Site #5 | 2 | Yes | 320 | 289 | 609 | 99 | 85 |
| | 2 | No | 224 | 458 | 682 | 77 | 111 |
| Site #1 | 3 | Yes | 298 | 297 | 595 | 110 | 94 |
| | 3 | No | 211 | -- | ?? | 90 | 101 |
| Site #4 | 3 | Yes | 455 | 383 | 838 | 101 | 127 |
| | 3 | No | 383 | 400 | 783 | 89 | 98 |
| Site #7 | 4+ | Yes | 212 | 207 | 419 | 97 | 96 |
| | 4+ | No | 224 | 153 | 377 | 115 | 94 |

# Sanding vs. Pruning Experiment

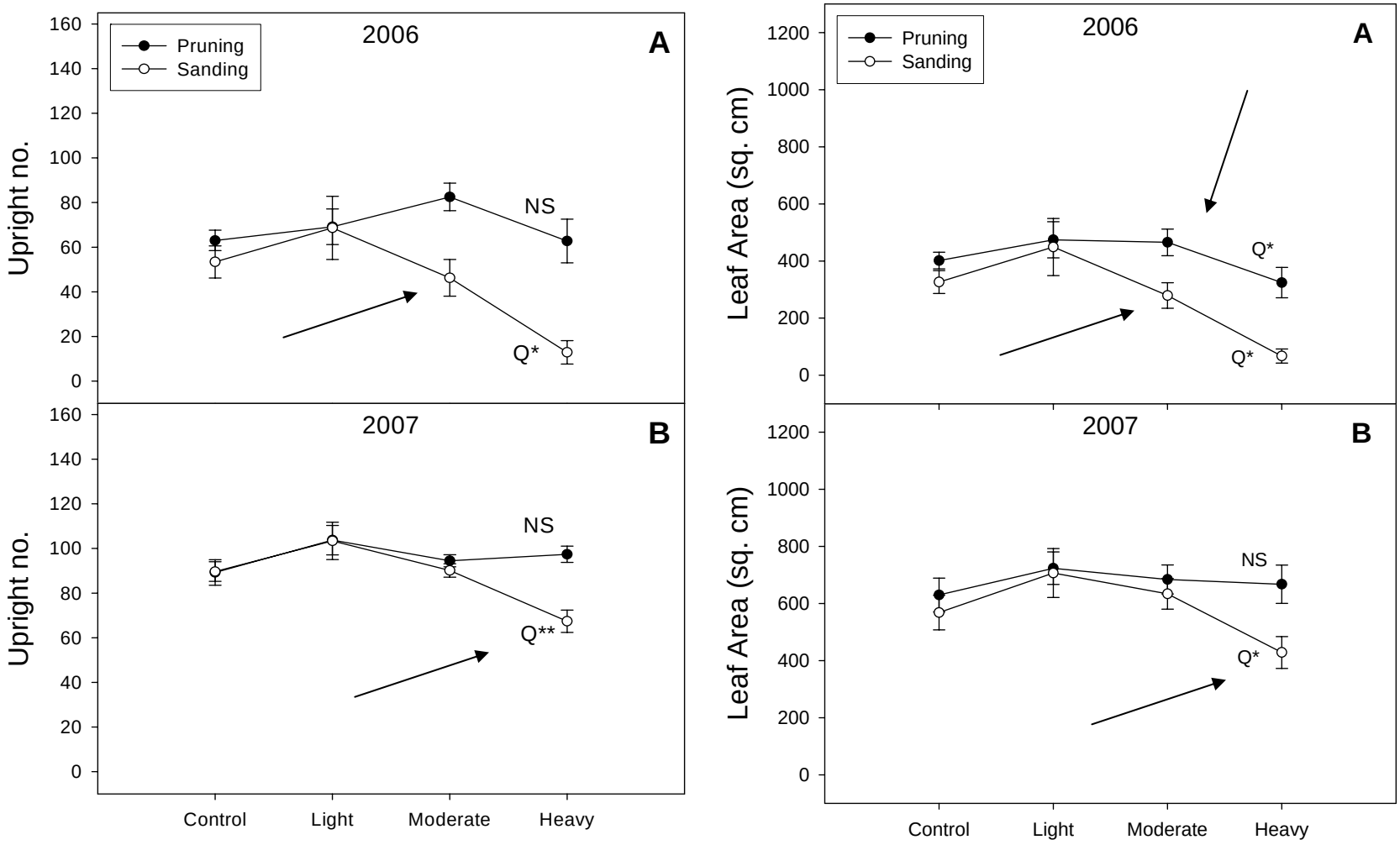
Graduate Project

Brett Suhayda
C. DeMoranville and J. Vanden Heuvel, Advisors

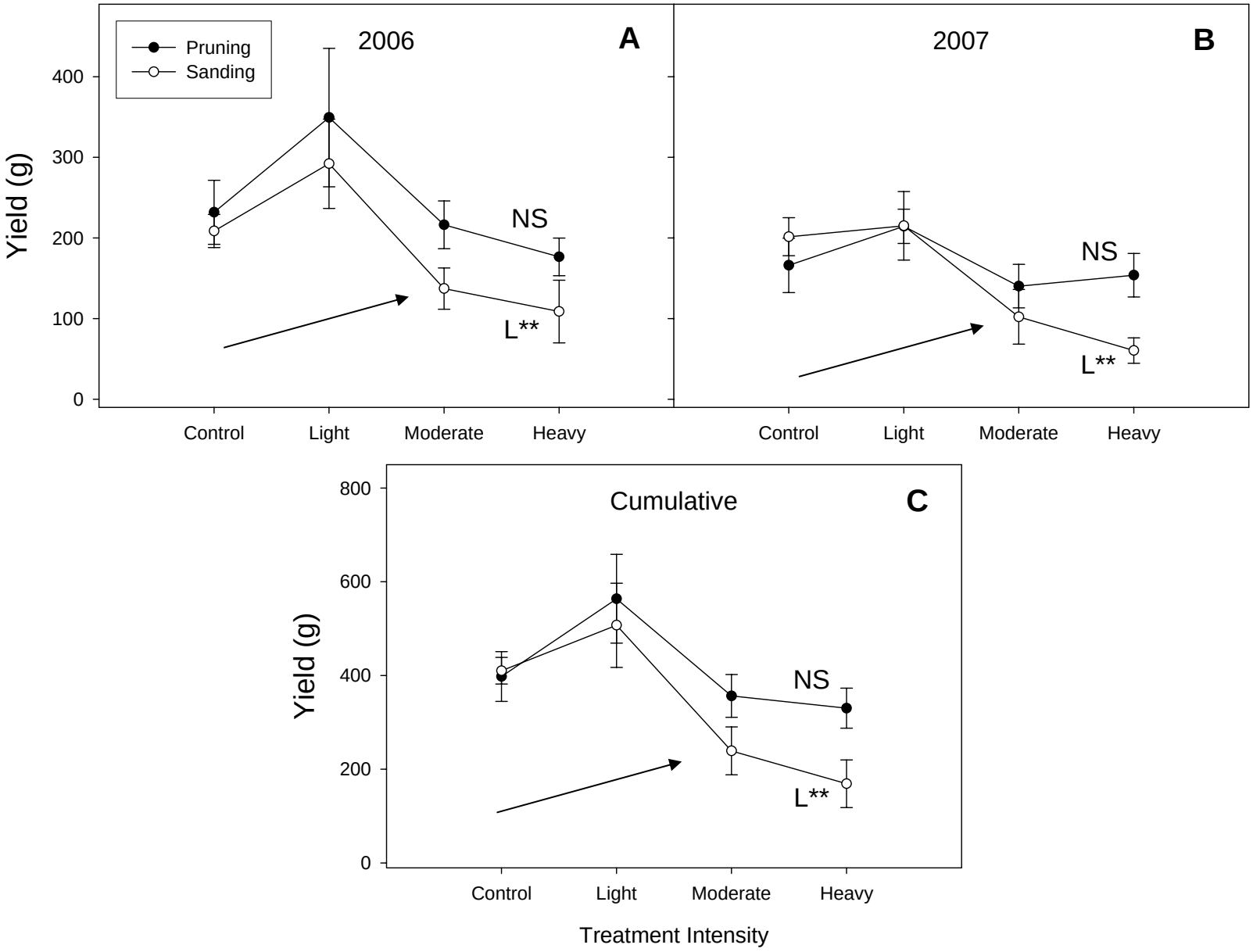
# Levels

- Pruning
  - Control (none)
  - Light (single pass)
  - Medium (2 passes)
  - Heavy (3 passes)
- Sanding
  - Control (none)
  - Light (1/2 inch)
  - Medium (1 inch)
  - Heavy (1.5 inch)

# Effect of ’06 Sanding and Pruning on canopy



# Effect of ’06 Sanding and Pruning on Yield



# Conclusions - yield

- In the first year, pruning treatments show higher yield than sanding (in foot square sampling)
- Low intensity treatment plots had best yield but after that yield declined with intensity
- By year 2, yield remained lower in two high intensity treatments – especially with sanding

# SARE Grower Survey

- Extensive survey in 2006
- Following up today with a second mini-survey

Questions?